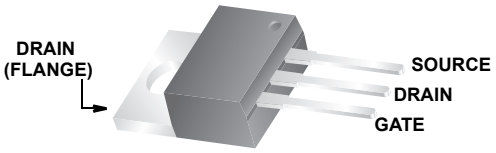
FDP8878
N-Channel Logic Level PowerTrench® MOSFET
30V, 40A, 15mΩ

General Descriptions

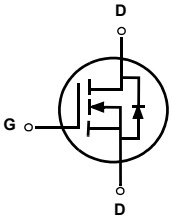
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(ON)}$ and fast switching speed.

Features

- $r_{DS(ON)}$ = 15mΩ, V_{GS} = 10V, I_D = 40A
- $r_{DS(ON)}$ = 19mΩ, V_{GS} = 4.5V, I_D = 36A
- High performance trench technology for extremely low $r_{DS(ON)}$
- Low gate charge
- High power and current handling capability
- RoHS Compliant



TO-220AB
FDP SERIES



MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		30	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current Continuous (T_C = 25°C, V_{GS} = 10V)		40	A
	Continuous (T_C = 25°C, V_{GS} = 4.5V)		36	A
	Pulsed	(Note 4)	141	A
E_{AS}	Single Pulse Avalanche Energy (Note 1)	L = 1mH, I_{AS} = 11A	60	mJ
		L = 43μH, I_{AS} = 32A	22	
P_D	Power dissipation		40.5	W
T_J, T_{STG}	Operating and Storage Temperature		-55 to 175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 2)	3.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient at 1000 seconds (Note 3)	43	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8878	FDP8878	TO-220	Tube	n/a	45 units

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	30	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temp. Coefficient	I_D = 250μA, Referenced to 25°C		21		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 24V, V_{GS} = 0V, T_A = 150°C	-	-	250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(TH)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1.2	1.7	2.5	V
$\frac{\Delta V_{GS(TH)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C		-5		mV/°C
$r_{DS(ON)}$	Drain to Source On Resistance	I_D = 40A, V_{GS} = 10V	-	12	15	mΩ
		I_D = 36A, V_{GS} = 4.5V	-	16	19	
		I_D = 40, V_{GS} = 10V, T_A = 175°C	-	20	25	
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz	-	927	1235	pF
C_{OSS}	Output Capacitance		-	188	250	pF
C_{RSS}	Reverse Transfer Capacitance		-	1130	175	pF
R_G	Gate Resistance	f = 1MHz		3.0		Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V; V_{DD} = 15V, I_D = 40A, I_g = 1.0mA	-	17.1	23	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0V to 5V	-	9.2	12	nC
Q_{gs}	Gate to Source Gate Charge		-	2.6	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	1.7	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	3.7	-	nC
Switching Characteristics (V_{GS} = 10V)						
t_{ON}	Turn-On Time	V_{DD} = 15V, I_D = 40A, V_{GS} = 10V, R_{GS} = 16Ω	-	255	383	ns
$t_{d(ON)}$	Turn-On Delay Time		-	11.1		ns
t_r	Rise Time		-	244		ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	14.8		ns
t_f	Fall Time		-	35.3		ns
t_{OFF}	Turn-Off Time		-	50	75	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 40A	-	1.1	1.25	V
		I_{SD} = 3.2A	-	0.85	1.2	V
t_{rr}	Reverse Recovery Time	I_{SD} = 40A, dI_{SD}/dt=100A/μs	-	14.4	18.8	ns
Q_{RR}	Reverse Recovered Charge	I_{SD} = 40A, dI_{SD}/dt=100A/μs	-	5.1	6.7	nC

Notes:

1: Starting T_J = 25°C, V_{DD} = 30V, V_{GS} = 10V

2: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.

3: $R_{\theta JA}$ is measured with 1.0 in^2 copper on FR-4 board

4: Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%

Typical Characteristics T_A = 25°C unless otherwise noted

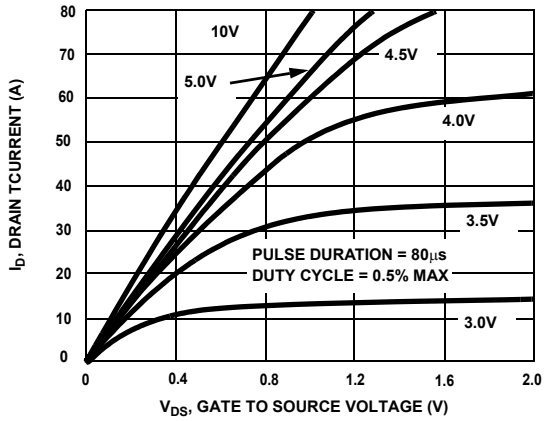


Figure 1. On Region Characteristics

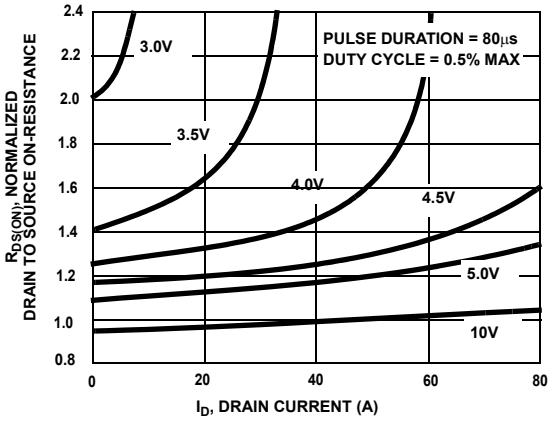


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

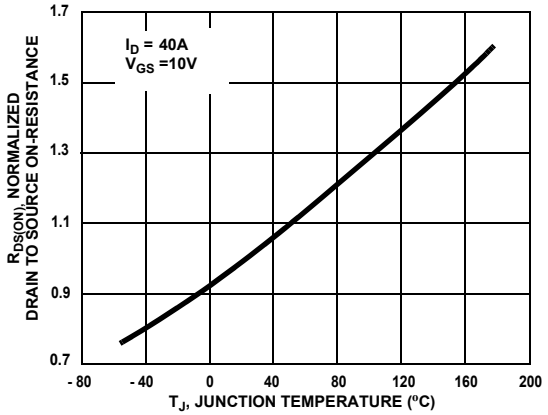


Figure 3. On Resistance Variation with Temperature

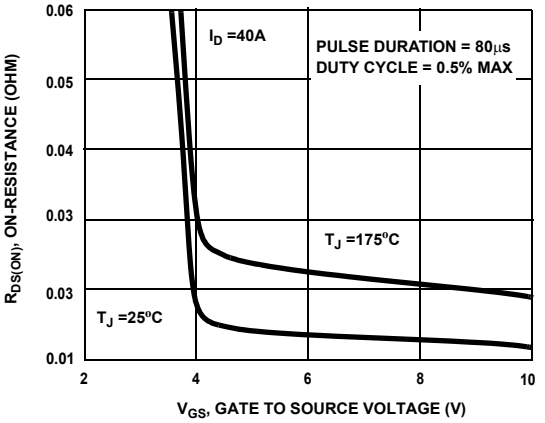


Figure 4. On-Resistance Variation with Gate-to-Source Votlage

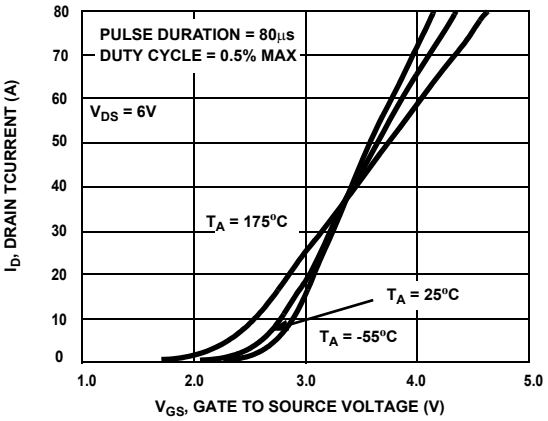


Figure 5. Transfer Characteristics

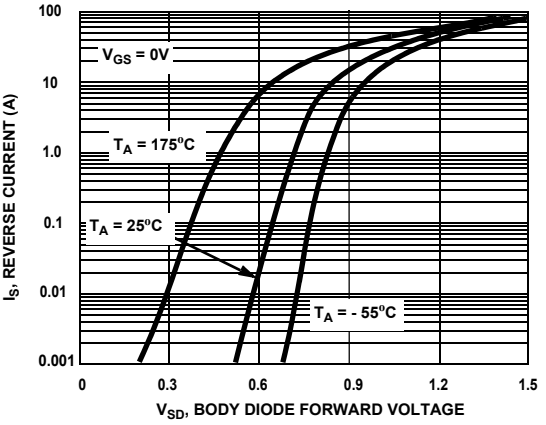


Figure 6. Body Diode Forward Voltage Variation With Source Current and Temperature